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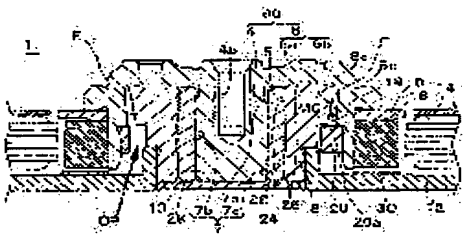
(54) DYNAMIC PRESSURE BEARING, MOTOR, DISK DRIVE, AND METHOD FOR MANUFACTURE OF MOTOR

(57)Abstract:
PROBLEM TO BE SOLVED: To easily prevent inclusion of bubbles in a lubricating fluid when manufacturing a motor provided with a fluid dynamic pressure bearing having an anti-loosening structure.
SOLUTION: A motor rotating assembly assembled by a rotor 60, an outer cylinder member 5, and a rotor magnet 16, is combined with a motor fixing assembly assembled by a sleeve 8 and a seal cap 10. A substantially annular anti-loosening member 20 having an opening is attached to a circumferential wall part 6b inner face of the rotor 60. The anti-loosening member 20 has a recessed part, and by this, an opening indicated by an arrow OP is formed after attachment. Oil which is the lubricating fluid is poured in from the opening. By attaching the anti-loosening member 20 before pouring in the oil, inclusion of bubbles in the oil which happens when attaching the anti-loosening member 20 after pouring in the oil can be easily prevented.



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CLAIMS

[Claim(s)]
[Claim 1]
It is a hydrodynamic bearing,
The 1st member which has a shank,
The 2nd member which holds said shank through the lubrication fluid for dynamic pressure generating with which it filled up continuously to the side-face side from free one end of said shank,
Preparation,
The member of either said 1st member and said 2nd member touches the interface of said lubrication fluid, or has the **** member located in the outside of said interface,
It has the stop section in which the member of another side counters with said **** member, and prevents alienation with said 1st member and said 2nd member,
The hydrodynamic bearing to which said **** member or said stop section is characterized by having opening or the crevice for impregnation of said lubrication fluid.
[Claim 2]
It is a hydrodynamic bearing according to claim 1,
The hydrodynamic bearing characterized by the ability to observe said interface from the exterior through said opening or said crevice.
[Claim 3]
It is a hydrodynamic bearing according to claim 1 or 2,
Said **** member is an abbreviation annular member centering on said shank,
The hydrodynamic bearing characterized by carrying out two or more formation of said opening or said crevice at equal intervals to the hoop direction centering on said shank.
[Claim 4]
It is a hydrodynamic bearing according to claim 1 to 3,
The hydrodynamic bearing to which a part of sleeve which said 2nd member has is characterized by being said stop section.
[Claim 5]
It is a hydrodynamic bearing according to claim 1 to 3,
The hydrodynamic bearing characterized by said a part of shank being said stop section.
[Claim 6]
It is a hydrodynamic bearing according to claim 5,
Said shank has the cone section of approximate circle drill type from which a path changes gradually toward free one end,
The hydrodynamic bearing characterized by the field by the side of the fixed end of said cone section countering with said **** member.
[Claim 7]
It is a motor,
A hydrodynamic bearing according to claim 1 to 6,
The drive made to rotate said 1st member relatively focusing on said shank to said 2nd member,
The motor characterized by preparation ******.
[Claim 8]
It is a motor according to claim 7,
The motor by which the member which has said opening or said crevice among said 1st member and the 2nd member is characterized by being the member of a fixed side.
[Claim 9]
It is a disk driving gear,

The case which holds the record medium of the shape of a disk which records information,
The motor according to claim 7 or 8 which is fixed to the interior of said case and made to rotate said record medium,
The disk driving gear characterized by having an access means to perform the writing or read-out of information to said record medium.
[Claim 10]
It is the manufacture approach of the motor equipped with the hydrodynamic bearing,
The process which combines the 1st member which inserts a shank in an attaching part and has said shank, and the 2nd member which has said attaching part,
The process which attaches in the member of either said 1st member and said 2nd member the **** member which prevents alienation with said 1st member and said 2nd member,
The process which supplies the lubrication fluid for dynamic pressure generating to the gap between said shanks and said attaching parts through opening or the crevice established in the member or said **** member of another side,
The manufacture approach of the motor characterized by ****(ing).
[Claim 11]
It is the manufacture approach of a motor according to claim 10,
The manufacture approach of the motor characterized by having further the process which decompresses said gap to which said lubrication fluid was supplied, and is returned to ordinary pressure.
[Claim 12]
It is the manufacture approach of a motor according to claim 10 or 11,
The manufacture approach of the motor characterized by having further the process which attaches the member which has some rotation drives after the process which supplies said lubrication fluid at said the 1st member or said 2nd member.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
Especially this invention is suitable for the application to the motor of a disk driving gear about the hydrodynamic bearing.
[0002]
[Description of the Prior Art]
From the former, the hydrodynamic bearing using the dynamic pressure generated in a fluid, such as oil made to intervene between a shaft and a sleeve, is used as bearing of the motor which drives a record disk in disk driving gears, such as a hard disk drive unit and removable disk equipment. Various devices are made in order to make it body of revolution not separate from a fixed object as a shaft does not escape from the motor by which such a hydrodynamic bearing was adopted from a sleeve.
[0003]
For example, the technique of making shaft orientations generate magnetic attraction between body of revolution and a fixed object is known by shifting and arranging the magnet for fields and armature to radial about shaft orientations. Moreover, after preparing the **** stop section in one member of a shaft and a sleeve (or these extension parts) and carrying out fitting of a shaft and the sleeve, a **** member is fixed to the member of another side, and the **** structure where the stop section and a **** member restrict alienation of a shaft and a sleeve may be adopted.
[0004]
Drawing 1 (a) In case - (c) manufactures the conventional motor, it is drawing showing signs that the hydrodynamic bearing which has **** structure is assembled. In addition, an assembly is performed where the upper and lower sides are reversed from the usual posture.
[0005]
The shaft 4 of a hydrodynamic bearing is formed in the center section of disc-like top-plate 6a at top-plate 6a and one, as shown in drawing 1 (a). Top-plate 6a constitutes a rotor hub with peripheral wall section 6b of the shape of a cylinder (that is, extended up with the posture of drawing 1 (a)) which hangs from the periphery edge, and Rota 60 is constituted by the rotor hub and the shaft 4. Rota 60 consists of ferromagnetic material. Moreover, the Rota magnet (magnet for fields) 16 is attached, the annular magnetic-shielding plate 9 which consists of ferromagnetic material is further pinched and attached between the upper part of the Rota magnet 16, and Rota 60, and the motor rotation assembly MR0 is constituted by the peripheral face of peripheral wall section 6b with Rota 60, the Rota magnet 16, and the magnetic-shielding plate 9. the record disk used by the motor rotation assembly MR0 rotating after motor completion is an attachment **** thing.
[0006]
The oil F which is a lubrication fluid for hydrodynamic bearings is poured into the crevice RS of the motor rotation assembly MR0 from Nozzle NZ, and as shown in drawing 1 (b), the motor fixed assembly MS 0 which consists of a sleeve 8 and a seal cap 10 is inserted so that a shaft 4 may be wrapped in. The motor fixed assembly MS 0 is fixed to the bracket equipped with the stator (armature) which consists of two or more teeth after motor completion.
[0007]
The gaps 22 and 24 which the peripheral face of a shaft 4 and the inner skin of a sleeve 8 counter and form constitute the radial bearing section, and the gap 26 which the inside of top-plate 6a and the end face of a sleeve 8 counter and form, and the gap 28 which the end face of the free end of a shaft 4 and the inside of a seal cap 10 counter and form constitute the thrust bearing section. The groove (illustration abbreviation) for generating dynamic pressure is prepared in the oil F with which it filled up at either of the opposed faces of gaps 22, 24, and 26. The dimension of the gap width of face of the gaps 22, 24, and 26 at the time of

completion is about dozens of micrometers. Moreover, the oil F with which it broke off and filled up from the gap 26 faces bearing outer space, and the gap 29 formed in the peripheral face of a sleeve 8 forms the oil interface. Gap width of face increases gradually toward the method of the outside of bearing, and a gap 29 holds oil according to the capillary tube force of oil.

[0008]

Vacuum degassing processing is performed to Oil F so that the oil F poured into the gap may not break off and it may fill up with it excluding air bubbles. Then, as shown in drawing 1 (c), the circular ring-like **** member 200 fixes to the inner skin of peripheral wall section 6b of Rota 60. The assembly for dynamic pressure bearing in a motor is completed now. Stop section 200a is prepared in the peripheral face of a sleeve 8, and the field of stop section 200a and the field of the **** member 200 counter it mutually through a uniform gap in the perimeter about shaft orientations. When bearing receives the unusual force in shaft orientations, it is prevented by the **** member 200 and stop section 200a that a shaft 4 and a sleeve 8 estrange.

[0009]

In addition, by the patent reference 1, the **** member by which the crevice was formed in the hole where a shaft is inserted is indicated. It is thought that this crevice is for inserting in a **** member the shaft which has the vena contracta. That is, by the patent reference 1, it has the structure where the narrow part and a **** member are engaged, by moving the shaft after inserting in a **** member to the center of a **** member.

[0010]

[Patent reference 1]

JP,6-223494,A

[0011]

[Problem(s) to be Solved by the Invention]

In the hydrodynamic bearing which has the conventional **** structure shown in drawing 1 (c), in case the motor rotation assembly MR0 is equipped with the **** member 200 after removing the air bubbles in Oil F by vacuum degassing, there is a possibility that the oil with which both assemblies move relatively and the bearing gap is filled up may fracture, and air bubbles may mix. In addition, in order to check whether degassing has been performed appropriately by fluctuation of the interface of oil, degassing needs to be performed before the **** member 200 is attached.

[0012]

Although it has the advantage in which structure becomes easy rather than the partialness philharmonic structure where the interface becomes two or more places when it is the full philharmonic structure where the interface of a liquefied lubrication fluid and air, such as oil, becomes only one place (that is, all the lubrication fluids currently used for bearing serve as one continuation), as shown in drawing 1 (c), it has the fault that it is difficult to assemble so that air bubbles may not mix in a lubrication fluid. The lubrication fluid by the thermal expansion of air bubbles begins to leak, and mixing of the air bubbles to a lubrication fluid causes fault surfacing in the ** thrust bearing section, abnormality contact of the bearing surface by lack of a lubrication fluid, etc., and becomes the cause of reducing the bearing engine performance.

[0013]

Although it was avoidable when assembling the problem that air bubbles mixed in a lubrication fluid during this assembly so that the motor rotation assembly MR0 and the motor fixed assembly MS 0 might not be displaced relatively, conventionally, by the hydrodynamic bearing of structure, with the time and effort and complicatedness on an activity with too much performing such assembly operation, the realistic solution could not become and a new solution was demanded. In addition, this problem is not generated only in the hydrodynamic bearing shown in drawing 1 (c).

[0014]

This invention sets it as the main purpose to offer the hydrodynamic bearing which can be made in view of the above-mentioned technical problem, can assemble while having **** structure, and can sometimes prevent mixing of air bubbles easily at a lubrication fluid.

[0015]

[Means for Solving the Problem]

The 1st member which invention according to claim 1 is a hydrodynamic bearing, and has a shank, It has the 2nd member which holds said shank through the lubrication fluid for dynamic pressure generating with which it filled up continuously to the side-face side from free one end of said shank. The member of either said 1st member and said 2nd member touches the interface of said lubrication fluid. Or it has the **** member located in the outside of said interface, and has the stop section in which the member of another side counters with said **** member, and prevents alienation with said 1st member and said 2nd member, and said **** member

or said stop section has opening or the crevice for impregnation of said lubrication fluid.
[0016]
Invention according to claim 2 is a hydrodynamic bearing according to claim 1, and can observe said interface from the exterior through said opening or said crevice.
[0017]
Invention according to claim 3 is a hydrodynamic bearing according to claim 1 or 2, said **** member is an abbreviation annular member centering on said shank, and two or more formation of said opening or said crevice is carried out at equal intervals to the hoop direction centering on said shank.
[0018]
Invention according to claim 4 is a hydrodynamic bearing according to claim 1 to 3, and a part of sleeve which said 2nd member has is said stop section.
[0019]
Invention according to claim 5 is a hydrodynamic bearing according to claim 1 to 3, and said a part of shank is said stop section.
[0020]
Invention according to claim 6 is a hydrodynamic bearing according to claim 5, said shank has the cone section of approximate circle drill type from which a path changes gradually toward free one end, and the field by the side of the fixed end of said cone section counters with said **** member.
[0021]
Invention according to claim 7 is a motor, and is equipped with a hydrodynamic bearing according to claim 1 to 6 and the drive made to rotate said 1st member relatively focusing on said shank to said 2nd member.
[0022]
Invention according to claim 8 is a motor according to claim 7, and the member which has said opening or said crevice among said 1st member and the 2nd member is a member of a fixed side.
[0023]
Invention according to claim 9 is a disk driving gear, and it is fixed to the interior of the case which holds the record medium of the shape of a disk which records information, and said case, and it is equipped with the motor according to claim 7 or 8 made to rotate said record medium and an access means to perform the writing or read-out of information to said record medium.
[0024]
The process which combines the 1st member which invention according to claim 10 is the manufacture approach of the motor equipped with the hydrodynamic bearing, and inserts a shank in an attaching part and has said shank, and the 2nd member which has said attaching part, The process which attaches in the member of either said 1st member and said 2nd member the **** member which prevents alienation with said 1st member and said 2nd member, It has the process which supplies the lubrication fluid for dynamic pressure generating to the gap between said shanks and said attaching parts through opening or the crevice established in the member or said **** member of another side.
[0025]
Invention according to claim 11 is the manufacture approach of a motor according to claim 10, and has further the process which decompresses said gap to which said lubrication fluid was supplied, and is returned to ordinary pressure.
[0026]
Invention according to claim 12 is the manufacture approach of a motor according to claim 10 or 11, and has further the process which attaches the member which has some rotation drives after the process which supplies said lubrication fluid at said the 1st member or said 2nd member.
[0027]
[Embodiment of the Invention]
Drawing 2 is drawing of longitudinal section in which it is shown near the bearing of the motor 1 for a disk drive concerning the gestalt of operation of the 1st of this invention. The motor 1 is equipped with Rota 60 where the rotor hub 6 which consists of peripheral wall section 6b of the shape of a cylinder which hangs caudad from the periphery edge of approximate circle tabular top-plate 6a to which the upper limit of a shaft 4 and a shaft 4 is located in a center section, and this top-plate 6a was formed in one. Rota 60 consists of ferromagnetic material. The peripheral face of a shaft 4 is equipped with the cylinder-like outer case member 5. Moreover, to the peripheral face of peripheral wall section 6b of a rotor hub 6 The Rota magnet (magnet for fields) 16 is attached, and the annular magnetic-shielding plate 9 which consists of ferromagnetic material is further attached between the upper part of the Rota magnet 16, and a rotor hub 6. A motor rotation assembly is constituted by the outer case member 5, Rota 60, the Rota magnet 16, and the magnetic-shielding plate 9.

[0028]
The record disk used by a motor rotation assembly rotating to disk installation section 6c which is in the periphery section of Rota 60 after motor completion is laid. A record disk etc. is held by the clamper which is not illustrated, is concluded by female screw hole 4b and the male screw (un-illustrating) which were formed in the upper part side (top-plate 6a side of a rotor hub 6) of a shaft 4, and is fixed to a rotor hub 6.
[0029]
A motor 1 is further equipped with the seal cap 10 which has the field which counters the free some parts side of a shaft 4 while it blockades the bell shape sleeve 8 supported for a shaft 4 and the outer case member 5, enabling free rotation, and the lower part of a sleeve 8, and a motor fixed assembly is constituted by these. A motor fixed assembly is **(ed) by the bracket 12 equipped with the stator (armature) 14 which has two or more teeth which protrude on the method of the inside of radial inner, and is fixed to it. Since a shaft 4 is supported free [rotation], a motor 1 is a shaft rotation mold.
[0030]
Each magnetic core counters almost in accordance with shaft orientations through a radial gap, a stator 14 and the Rota magnet 16 are arranged, by exciting the coil which constitutes a stator 14 with the power from a power source (un-illustrating), the drive constituted with a stator 14 and the Rota magnet 16 generates rotation driving force, the motor rotation assembly equipped with the Rota magnet 16 rotates, and a disk drives them.
[0031]
A gap 26 is formed between the upper limit side of a sleeve 8, and the inferior surface of tongue of top-plate 6a, gaps 22 and 24 are formed between the peripheral face of the outer case member 5, and the inner skin of a sleeve 8, and a gap 28 is formed between the end face of the outer case member 5 and the end face of a shaft 4, and the inside of a seal cap 10. The minute gaps 26, 22, 24, and 28 are continuing mutually, while filling up with the oil F which is a lubrication fluid for dynamic pressure generating continuously to a side-face side from free one end of a shank (a shaft 4 and outer case member 5), a shaft 4 and the outer case member 5 are held through Oil F at a sleeve 8, and the so-called hydrodynamic bearing of full philharmonic structure is constituted.
[0032]
Gaps 22 and 24 constitute the radial bearing section, and gaps 26 and 28 constitute the thrust bearing section. The opposed face of gaps 22, 24, and 26 (one of fields is sufficient.) the following -- the same . **** -- the groove (un-illustrating) for generating dynamic pressure is prepared in the oil F with which it filled up. Moreover, between the peripheral face of a shaft 4, and the inner skin of the outer case member 5, the free passage hole 7 formed of a streak of spiral slot (Signs 7a, 7b, and 7c are attached in drawing 2 .) for enabling circulation of the oil held in a gap 26 and the oil held in a gap 28 is formed along with the peripheral face of a shaft 4.
[0033]
Moreover, it protruded on the method of the outside of radial, and annular flange 8a which has the inclined plane whose diameter is reduced as a peripheral face estranges from the upper limit side of a sleeve 8 was prepared in the upper limit section of the peripheral face of a sleeve 8, and it has countered radial in the state of the inner skin of peripheral wall section 6b, and non-contact. The gap between the inner skin of peripheral wall section 6b and the peripheral face of flange 8a does not break off from the adjoining gap 26, and it fills up with oil, and from the peripheral face of flange 8a inclining, the radial dimension goes caudad, and is increased gradually, and a gap cross section becomes taper-like. And the taper seal section 18 which holds the interface MC of Oil F and the air of the bearing exterior, and is made to **** Oil F in a gap by the inner skin of peripheral wall section 6b and the peripheral face of flange 8a is constituted.
[0034]
Only in the taper seal section 18, the surface tension of Oil F and an outside atmospheric pressure balance (full philharmonic structure), and, as for the oil F held in a series of gaps 22, 24, 26, and 28, the interface MC of oil and air is formed in the shape of a meniscus. The taper seal section 18 has a function as an oil reservoir by giving allowances to gap space. That is, corresponding to the amount of oil held inside interface MC, according to the change in the volume of the oil F accompanying the thermal expansion and the heat shrink of Oil F, the location of Interface MC can move in the inside of gap space, and volume fluctuation of oil can be coped with.
[0035]
By the motor 1, the abbreviation annular **** member 20 centering on a shaft 4 has fixed by adhesion (on namely, outside of Oil F) etc. to the point rather than the taper seal section 18 in peripheral wall section 6b. The **** structure of Rota 60 over a sleeve 8 consists of fitting in each other in the state of non-contact to stop section 20a to which the **** member 20 is located in the lower part of flange 8a in the lower limit

section of the peripheral face of a sleeve 8. moreover, as shown by the arrow head OP, the crevice (about a concrete configuration, it mentions later) is established in a part of **** member 20, and the **** member 20 and stop section 20a are countered combining a motor rotation assembly and a motor fixed assembly -- making -- alienation of both assemblies -- after prevention measures are taken, it is possible to pour in the oil which is a lubrication fluid from opening by this crevice.

[0036]

The dynamic pressure both do [dynamic pressure] induction shall be balanced on parenchyma, and a flow of oil shall not produce the groove for dynamic pressure generating between a gap 22 and a gap 24 among both. Rota 60 is supported by the fluid dynamic pressure generated in gaps 22 and 24 in two shaft-orientations upper and lower sides of the upper part of the outer case member 5, and the lower part, and an alignment operation and the restoration operation which receives falling of Rota 60 are acquired with it. Moreover, in a gap 26, the groove which carries out induction of the dynamic pressure which tends toward shaft orientations is formed, and the pressure of the oil in a gap 26 is told to the oil in a gap 28 by the free passage hole 7.

[0037]

The gap 26 is the gap of the thrust bearing section by dynamic pressure, and the gap 28 is the gap of the thrust bearing section by the static pressure using the internal pressure of the oil raised in the gap 26. Moreover, since gaps 26 and 28 serve as the parenchyma top said ** with the free passage hole 7, the generating problem of the air bubbles which the negative pressure which internal pressure turns into below atmospheric pressure in the oil held in a gap 28 did not occur, and originated in negative pressure, and the bearing fault by the generated air bubbles are canceled.

[0038]

A thrust yoke 30 consists of annular ferromagnetic material, and is arranged in an opposite location with the Rota magnet 16 of a bracket 12, and the magnetic-attraction force of shaft orientations produces it between a thrust yoke 30 and the Rota magnet 16. While this magnetic-attraction force and ****** of Rota 60 which is the difference of thrust ** generated in gaps 26 and 28 are balanced and support of the thrust direction (shaft orientations) of Rota 60 is stabilized, fault surfacing of Rota 60 is controlled. The magnetic energization to such Rota 60 is generable also by shifting the magnetic core of a stator 14 and the Rota magnet 16 to shaft orientations.

[0039]

Next, the erector of bearing degree is explained. Drawing 3 is drawing showing the flow of the process at the time of being assembled near the bearing of a motor 1, and drawing 4 (a) thru/or (c) are drawings showing the components assembled. First, as shown in drawing 4 (b) and (c), the motor rotation assembly MR1 and the motor fixed assembly MS 1 are assembled (steps S11 and S12). Then, the shaft 4 (and outer case member 5) of the motor rotation assembly MR1 is inserted in the sleeve 8 of the motor fixed assembly MS 1, and these assemblies are put together (step S13). Furthermore, the approximate circle annular **** member 20 shown in drawing 4 (a) fixes by adhesion etc. to the peripheral wall section 6b inner skin of Rota 60 (step S14), and will be in the condition which shows in drawing 5 .

[0040]

Drawing 6 is the top view of the **** member 20. In addition, in drawing 6 , it is illustrating by giving an parallel slash to **** member 20 the very thing. Drawing 4 (a) shows the cross section of the **** member 20 in arrow-head X1-P1-Y1 in drawing 6 . As shown in drawing 4 (a) and drawing 6 , two or more formation of the crevice C1 for oil impregnation is carried out at equal intervals to the hoop direction centering on a revolving shaft at the **** member 20 at inner skin. For this reason, in assembled bearing, opening shown by the arrow head OP will be formed of the crevice C1 of the **** member 20 into drawing 5 .

[0041]

In bearing, after the **** member 20 is attached, the oil impregnation nozzle NZ is used from this opening, the filling pump with oil which is a lubrication fluid is performed, and oil is supplied to a series of gaps 26, 22, 24, and 28 shown in drawing 2 (step S15). The poured-in oil advances into the back side of a detailed gap by capillarity, and forms an oil interface in the gap of the peripheral face of flange 8a, and the taper seal section 18 is constituted. In addition, oil can be quickly supplied to all gaps by performing impregnation from opening by two or more crevices C1.

[0042]

After oil impregnation of a predetermined amount finishes, the air bubbles which remain without the air bubbles and oil which the perimeter of bearing was decompressed and were mixed in oil spreading are removed. Then, it is returned to the bottom of an atmospheric pressure (step S16), the bracket 12 grade which has a stator 14 is attached in the motor fixed assembly MS 1, and a motor 1 completes bearing (step S17). In addition, the assembly of a motor 1 can be easily performed by attaching the stator 14 which are some rotation drives of a

motor 1 after the assembly of bearing.
[0043]
As mentioned above, by the motor 1, by establishing a crevice C1 in the **** member 20, after attaching the **** member 20, it is supposed that it is possible to pour in oil. In case this attaches a **** member after oil impregnation like before, it is prevented easily that air bubbles enter into oil. Consequently, bearing performance degradation is prevented and stabilization of actuation of a motor 1 is realized. Moreover, since precise assembly operation which air bubbles do not mix like before during the assembly of a motor becomes unnecessary, assembly-operation nature becomes good and reduction of a manufacturing cost is realized. In addition, after the **** member 20 fixes, the amount of the shaft orientations between the motor rotation assembly MR1 and the motor fixed assembly MS 1 and the radius-of-gyration direction which can be displaced relatively is a part for the gap width of face of gaps 22, 24, and 26, and is dozens of microns only, and if it is movement magnitude of this amount, there will be no possibility that air bubbles may mix into oil.
[0044]
Moreover, since the **** member 200 is fixed with the conventional structure shown in drawing 1 (c) after pouring in oil, Although inspecting visually after installation of the **** member 200 is impossible, whether fluctuation of the interface of oil was seen [whether oil is poured in correctly and] especially, and degassing was performed appropriately With the structure shown in drawing 2 , since observation of the oil after impregnation is enabled through opening by the crevice C1 of the **** member 20 located in the outside of an oil interface, it also becomes possible to check whether an impregnation condition and degassing have been performed appropriately by fluctuation of an oil interface. Moreover, with the structure shown in drawing 2 , the problem of cellular mixing is not avoided by modification of the **** member 20, it is not accompanied by modification of bearing, and the predominance of the structure which is the advantage of full philharmonic structure does not fall. Furthermore, the structure where the possibility of mixing of air bubbles can check oil after **** member 20 installation since the direction in case the free passage hole 7 is formed is high is suitable for especially bearing that has the free passage hole 7. In addition, observation of the location of an oil interface may be performed by inserting a probe etc. using a measuring instrument.
[0045]
Drawing 7 (a) is the top view (the parallel slash is attached.) showing other examples of the **** member 20, and drawing 7 (b) is drawing of longitudinal section in arrow-head X2-P2-Y2 in drawing 7 (a). As shown in drawing 7 (a) and (b), it replaces with the **** member 20 in a crevice C1, and opening C2 may be formed. That is, if opening to [with the crevice or opening of the **** member 20 / gap / of bearing] after installation from the outside is formed, the configuration of the **** member 20 may be changed suitably.
[0046]
Drawing 8 (a) is the top view (the parallel slash is attached.) showing the example of further others of the **** member 20, and drawing 8 (b) is drawing of longitudinal section in arrow-head X3-P3-Y3 in drawing 8 (a). The **** member 20 shown in drawing 8 (a) and (b) has two crevices C3. The crevice of the **** member 20 and the number of openings may be changed suitably. However, when the **** member 20 is attached in the member by the side of rotation (namely, motor rotation assembly), it is desirable that two or more formation of a crevice or the opening is carried out at equal intervals to the hoop direction of a rotational medial axis in consideration of the balance in the case of rotation.
[0047]
Drawing 9 is drawing showing other examples of bearing of a motor 1. In bearing shown in drawing 9 , the crevice C4 which removes a part of stop section 20a for **** of a sleeve 8, and becomes depressed in a medial-axis side is formed, and opening for oil impregnation shown by the arrow head OP is prepared. Neither a crevice nor opening is prepared in the **** member 20. In this case, since a crevice C4 is in the motor fixed assembly side (namely, side fixed at the time of installation of a motor 1) not rotating, the mass balance to rotation is not spoiled by the crevice C4.
[0048]
Drawing 10 is drawing of longitudinal section in which it is shown near the bearing of the motor 1 for a disk drive concerning the gestalt of operation of the 2nd of this invention. The motor 1 is equipped with the approximate circle tabular base member 2 which is a member for thrust bearings, and the shaft 4 by which one edge is fixed to the center section of the base member 2. A motor fixed assembly is constituted by the base member 2 and the shaft 4. Moreover, the base member 2 is fixed to the bracket 12 with which the stator 14 which has two or more teeth was arranged by press fit or adhesion. In addition, it may be formed in [a shaft 4 and the base member 2] one.
[0049]
Moreover, the motor 1 is equipped with Rota 60 which consists of a sleeve 8 which has the through tube in

which a shaft 4 is inserted, and a seal cap 11 which has the free edge end face of a shaft 4, and the field which counters while blockading upper limit section opening of a through tube. A sleeve 8 consists of ferromagnetic material. A motor rotation assembly is constituted by the Rota magnet 16 of the shape of a circular ring fixed to the periphery of Rota 60, the annular magnetic-shielding plate 9 which consists of ferromagnetic material pinched between the upper part of the Rota magnet 16, and Rota 60, and Rota 60. A motor rotation assembly lays the record disk used for disk installation section 6c in the periphery section of Rota 60 by rotating after motor completion, and holds this by the clamper which is not illustrated.

[0050]

The magnetic core is mutually arranged almost in accordance with shaft orientations through the gap a stator 14 and radial, the drive constituted by the Rota magnet 16 and the stator 14 generates torque (turning effort) with the power from a power source, and the Rota magnet 16 fixed to Rota 60 rotates the body of revolution constituted by the Rota magnet 16 and sleeve 8 grade by making a shaft 4 into a medial axis. Since body of revolution is supported free [rotation] to a shaft 4, a motor 1 is a shaft rotation mold.

[0051]

The notch is formed in the lower limit section periphery section of a sleeve 8, and the diameter of the peripheral face of a notch is reduced as it estranges from the base member 2. Moreover, peripheral wall section 2a which has the inner skin which counters in the state of non-contact at the peripheral face of a notch, and the lobe which goes in an edge at the method of outside in the periphery section of the base member 2 is prepared in the shaft 4 and this alignment.

[0052]

The gap 21 is formed between the inner skin of peripheral wall section 2a, and the peripheral face of a notch, the gap 24 is formed between the lower limit side of a sleeve 8, and the top face of the base member 2, the gap 25 is formed between the inner skin (front face of a through tube) of a sleeve 8, and the peripheral face of a shaft 4, and the gap 28 is formed between the free end face of a shaft 4, and the inferior surface of tongue of a seal cap 11. It is held without the oil which is a fluid for lubrication breaking off all over these gaps of a series of, and the so-called hydrodynamic bearing of full philharmonic structure is constituted. Moreover, width of face is large gradually toward the upper part, and a gap 21 forms the interface of oil and air, and has the function to hold oil like the taper seal section 18 of drawing 2 .

[0053]

The groove for dynamic pressure generating is formed in an opposed face, and radial dynamic pressure bearing consists of gaps 25. Moreover, a groove is formed also in the opposed face of a gap 24, and the thrust bearing section is constituted. Static pressure bearing using the internal pressure of the oil raised by the thrust bearing section consists of gaps 28.

[0054]

Moreover, while the annular thrust yoke 30 counters the Rota magnet 16 and shaft orientations, and is prepared in the bracket 12, the magnetic-attraction force of the shaft orientations generated between the Rota magnet 16 and the thrust yoke 30 and ****** which is the difference of the thrust dynamic pressure in gaps 24 and 28 are balanced and support of the thrust direction (shaft orientations) of Rota 60 is stabilized, fault surfacing of Rota 60 is controlled. The magnetic energization to such Rota 60 is generable also by shifting the magnetic core of a stator 14 and the Rota magnet 16 to shaft orientations.

[0055]

Moreover, the whole is carrying out abbreviation annular and the **** member 20 which has the lobe which goes to the method of inside in the lower part has fixed by adhesion etc. on the inferior surface of tongue of a sleeve 8. The lobe of the **** member 20 is fitting in each other in the state of non-contact to the stop section which is a lobe in peripheral wall section 2a of the base member 2, and the **** structure of a sleeve 8 over a shaft 4 is constituted. furthermore, as shown by the arrow head OP, a crevice prepares in a part of **** member 20 -- having -- **** -- a motor rotation assembly and a motor fixed assembly -- combining -- the **** member 20 -- both alienation -- after prevention measures are taken, it is supposed that it is possible to pour in the oil which is a lubrication fluid from opening by the crevice.

[0056]

Next, the erector of bearing degree is explained. The flow like an erector is the same as that of drawing 3 fundamentally. First, as shown in drawing 11 (a) and (b), the assembly of the motor rotation assembly MR2 and the motor fixed assembly MS 2 is performed (steps S11 and S12), a shaft 4 is inserted in a sleeve 8, and these assemblies are put together (step S13). Furthermore, the approximate circle annular **** member 20 shown in drawing 11 (c) fixes by adhesion etc. to Rota 60 (step S14), and will be in the condition which shows in drawing 12 .

[0057]

Drawing 13 is the top view of the **** member 20 (an parallel slash is attached and illustrated). In addition, drawing 11 (c) shows the cross section of the **** member 20 in arrow-head X5-P5-Y5 in drawing 13 . Two or more formation of the crevice C5 for oil impregnation is carried out like the gestalt of the 1st operation at the **** member 20 at inner skin. For this reason, in assembled bearing, opening shown by the arrow head OP will be formed of the crevice C5 of the **** member 20 into drawing 12 . In addition, a crevice C5 may be opening (refer to drawing 7 (a)).

[0058]

After the **** member 20 is attached, the filling pump with oil which is a lubrication fluid is performed from this opening, and oil is supplied to a series of gaps (step S15). Then, the air bubbles which decompressed and were mixed in oil are removed, and the perimeter of bearing is returned to the bottom of atmospheric pressure (step S16). Furthermore, the bracket which has the stator which are some rotation drives of a motor 1 is attached in the motor fixed assembly MS 2, and a motor 1 is completed (step S17).

[0059]

As mentioned above, also in the motor 1 concerning the gestalt of the 2nd operation, since a filling pump with oil is performed after installation of the **** member 20, preventing mixing of the air bubbles to oil easily is realized. Consequently, stabilization of actuation of a motor 1 and reduction of a manufacturing cost are realized.

[0060]

Drawing 14 is drawing showing other examples of bearing concerning the gestalt of the 2nd operation. In bearing shown in drawing 14 , a part of lobe to the outside of peripheral wall section 2a of the base member 2 is removed, a crevice C6 is formed, and, thereby, opening for oil impregnation shown by the arrow head OP is prepared. In this case, since a crevice C6 exists in the motor fixed assembly side not rotating, the mass balance to rotation is not spoiled by the crevice C6.

[0061]

Drawing 15 is drawing of longitudinal section in which it is shown near the bearing of the motor 1 for a disk drive concerning the gestalt of operation of the 3rd of this invention. The motor 1 serves as a rotor hub 6 and the so-called shaft rotation mold with which a shaft 4 is supported free [rotation] to the fixed sleeve 8, as shown in drawing 15 . The shaft 4 consists of 4d (namely, approximate circle drill type with which a path decreases gradually toward free one end) of cone sections which have the substantially inverted trapezoidal cross-section configuration projected to the method of the outside of radial rather than shank 4c while connecting with cylinder-like shank 4c and shank 4c.

[0062]

A rotor hub 6 consists of ferromagnetic material, the periphery inferior surface of tongue of a rotor hub 6 is equipped with the Rota magnet 16, and shank 4c of a shaft 4 is fixed to the core of a rotor hub 6 by adhesion etc. A motor rotation assembly is constituted by a shaft 4, a rotor hub 6, and Rota magnet 16 grade. A record disk etc. is fixed to disk installation section 6c on the periphery section top face of a rotor hub 6 after motor completion.

[0063]

Moreover, the cylinder-like sleeve 8 has cone-like crevice 8b which has the cross-section configuration of the abbreviation trapezoidal shape corresponding to the shape of surface type of 4d of cone sections of a shaft 4. The periphery lower part of a sleeve 8 is fixed to the bracket 12 with which the stator 14 was arranged by press fit or adhesion, and a motor fixed assembly is assembled. In cone-like crevice 8b of a sleeve 8, 4d of cone sections of a shaft 4 is arranged, and the approximate circle annular **** member 20 in which shank 4c of a shaft 4 is inserted is being fixed to the up open end of cone-like crevice 8b by adhesion etc. Thereby, the field by the side of the fixed end of 4d of cone sections plays the **** member 20 and a role of the stop section to counter.

[0064]

as shown by the arrow head OP, a crevice C7 (refer to drawing 18) prepares in a part of **** member 20 -- having -- **** -- a shaft 4 and a motor fixed assembly -- combining -- the **** member 20 -- both alienation -- after prevention measures are taken, it is supposed that it is possible to pour in the oil which is a lubrication fluid from this opening.

[0065]

Moreover, the gap is formed between 4d of cone sections, and cone-like crevice 8b, and it is held, without oil breaking off in this gap (from free one end of a shaft 4 to namely, a side-face side continuously). The groove 17 for dynamic pressure generating is formed in the inclined plane whose diameter is reduced in the shape of a taper toward an inferior surface of tongue from the peripheral face of 4d of cone sections, i.e., a top face, and induction of the fluid dynamic pressure is carried out by the groove 17 between the peripheral face of 4d of

cone sections, and the inner skin of cone-like crevice 8b at the time of relative rotation of a rotor hub 6 and a shaft 4.

[0066]

A miniaturization and thin-shape-izing of bearing are realized without between the opposed faces of the inclined pair becoming possible [realizing the function of both the radial bearing section and the thrust bearing section], and spoiling rotation precision by one dynamic pressure bearing, by functioning as dynamic pressure bearing. Moreover, the circular crevice (illustration abbreviation) is formed in the abbreviation center section of the pars basilaris ossis occipitalis of cone-like crevice 8b so that a gap with the base of 4d of cone sections may be expanded a little. This circular crevice has a function supplementary to the foreign matter in oil, and the role which prevents wear of the bearing by diffusion of a foreign matter is played.

[0067]

The interface of the oil and air which are held in the gap formed between 4d of cone sections and cone-like crevice 8b is formed in the gap between the inferior surface of tongue of the **** member 20, and the top face of 4d of cone sections. Namely, the **** member 20 is in the condition of touching an interface. Since it is stored in the shape of a circular ring so that the oil in this gap may have an interface inside, oil will be pressed in an operation of a centrifugal force by the method of the outside of radial at the time of rotation, an oil seal function is strengthened, and scattering to the bearing exterior of oil is controlled.

[0068]

Next, the erector of bearing degree is explained. The assembly of bearing is the same as that of drawing 3 fundamentally. However, shaft 4 the very thing turns into a motor rotation assembly. The motor fixed assembly MS 3 shown in drawing 16 (d) is specifically assembled, the shaft 4 shown in drawing 16 (c) is inserted in cone-like crevice 8b of a sleeve 8, and it is assembled, as the approximate circle annular **** member 20 shown in drawing 16 (b) fixes by adhesion etc. in the upper limit section of a sleeve 8 and it is shown in drawing 17 .

[0069]

Drawing 18 is the top view of the **** member 20 (an parallel slash is attached and illustrated). In addition, drawing 16 (b) shows the cross section of the **** member 20 in arrow-head X7-P7-Y7 in drawing 18 . Two crevices C7 for abbreviation slot-like impregnation [oil] are formed in the inner circumference side at the **** member 20. A crevice C7 may be opening.

[0070]

Of the crevice C7 of the **** member 20, opening shown by the arrow head OP in drawing 17 is formed, and the oil of the specified quantity is poured into a bearing gap using an oil impregnation nozzle from this opening. Then, reduced pressure degassing is performed, the rotor hub 6 with Rota magnet 16 shown in drawing 16 (a) is further fixed to shank 4c of a shaft 4 by adhesion etc., and a motor 1 is completed. In addition, the assembly of a motor 1 can be easily performed by attaching the Rota magnet 16 grade which are some rotation drives of a motor 1 after the assembly of bearing.

[0071]

Also in the motor 1 concerning the gestalt of the 3rd operation, since a filling pump with oil is performed after installation of the **** member 20, preventing mixing of the air bubbles to oil is realized. Moreover, since it is possible to observe the interface of oil in the case of oil impregnation, it also becomes possible to check a filling-pump-with-oil condition. Consequently, stabilization of actuation of a motor 1 and reduction of a manufacturing cost are realized. In addition, although illustration is omitted, a seal is stuck on the top face of the **** member 20, and oil leaks from a crevice C7. This seal is after oil impregnation and is stuck at the process of drawing 17 before attaching a rotor hub 6.

[0072]

In addition, the vertical inversion of the physical relationship of a shaft 4 and a sleeve 8 may be carried out as a modification of the motor 1 concerning the gestalt of the 3rd operation. In this case, it becomes a motor fixed assembly at the time of a shaft 4 being assembly. Moreover, shank 4c of a shaft may be a configuration which ** increases gradually toward free one end. At this time, it considers as the configuration where cone-like crevice 8b of a sleeve 8 was also doubled with it, and the part by the side of the medial surface toward which cone-like crevice 8b inclined plays a role of a **** member.

[0073]

Next, the disk driving gear which has a motor is explained with reference to drawing 19 . In the disk driving gear 50, the motor 52 for a disk drive by which it was equipped with the disk-like record medium 53 with which dust, dust, etc. have the degree of pole with little clean space, and, as for the interior of housing 51, memorize information is being fixed. Moreover, the head migration device has been arranged as an information access means to write information to a record medium 53, and this head migration device equips the interior of housing 51 with the actuator section 54 which makes the arm 55 supporting the head 56 which write the information on

a record medium 53, and a head 56, and a list move a head 56 and an arm 55 to the necessary location on a record medium 53.
[0074]
By using the motor 1 which explains with the gestalt of the above-mentioned implementation as such a motor 52 for a disk drive of the disk driving gear 50, and has a fluid hydrodynamic bearing device, while desired rotation precision and stability of operation are realized, low cost-ization is attained at the thin shape-ized list of the disk driving gear 50. The disk driving gear 50 may be equipment which is not limited to the so-called hard disk drive unit, but drives an optical disk, a magneto-optic disk, etc.
[0075]
As mentioned above, although the gestalt of operation of this invention has been explained, this invention is not limited to the gestalt of the above-mentioned implementation, but various deformation is possible for it.
[0076]
For example, although the magnetic circuit showed the thing of the direction opposed type of a path with the gestalt of the above-mentioned implementation, you may be a shaft-orientations opposed type. Moreover, the structure where a lubrication fluid can be poured in after installation of the **** member mentioned above is employable also to the motor configuration of possible various combination, such as an outer rotor mold, an inner rotor mold, an axial rotation mold, and an axial cover half.
[0077]
Temporary impregnation of the oil may be carried out in front of combination at a motor fixed assembly or a motor rotation assembly. Moreover, in order to prevent mixing of the air bubbles at the time of impregnation, oil impregnation may be performed in a reduced pressure environment.
[0078]
A crevice may be formed in magnitude to the extent that between crevices is caught with heights that the crevice of the **** member 20 in the gestalt of the above-mentioned implementation or a sleeve 8 (stop section 20a) should just be a crevice substantially.
[0079]
Although the balance of body of revolution is maintained with the gestalt of the above-mentioned implementation even if it is the case where a crevice and opening are formed in a body-of-revolution side by preparing a crevice and opening in the member which stops by countering the **** member 20 or the **** member 20 at equal intervals about an axial hoop direction Even if the crevice and opening for oil impregnation are the case where they are not regular intervals about an axial hoop direction (or only one is prepared), in order to maintain balance, a spindle may be formed a crevice and near the opening, or a dummy crevice and dummy opening may be prepared.
[0080]
With the gestalt of the above 1st and the 2nd implementation, although a part of sleeve 8 serves as the **** member 20 and the stop section which counters and a part of shaft 4 serves as the **** member 20 and the stop section which counters with the gestalt of the 3rd operation, the stop section may be prepared in other members. In addition, when the stop section is used as a part of sleeve 8 or shaft 4, it becomes possible to reduce the number of components of bearing.
[0081]
[Effect of the Invention]
In invention of claim 1, after attaching a **** member, mixing of the air bubbles after supply can be prevented by supplying a lubrication fluid.
[0082]
Moreover, in invention of claim 2, the interface of a lubrication fluid is observable after supply.
[0083]
Moreover, the bearing at the time of rotation can be balanced in invention of claim 3.
[0084]
Moreover, in invention of claims 4 and 5, the number of components of a hydrodynamic bearing is reducible.
[0085]
Moreover, in invention of claim 6, a miniaturization and thin-shape-izing of bearing are realized, without spoiling rotation precision.
[0086]
In invention of claim 7, stabilization of actuation of a motor and reduction of a manufacturing cost are realized.
[0087]
Moreover, in invention of claim 8, it can balance rotational easily.
[0088]

In invention of claim 9, thin-shape-izing and low-cost-izing of a disk driving gear are attained.
[0089]
In invention of claims 10 and 11, after attaching a **** member, mixing of the air bubbles after supply can be prevented by supplying a lubrication fluid.
[0090]
Moreover, in invention of claim 12, the assembly of a motor can be performed easily, preventing mixing of air bubbles.
[Brief Description of the Drawings]
[Drawing 1] (a) is [the sectional view of the conventional motor fixed assembly and a motor rotation assembly and (c of the sectional view of the conventional motor rotation assembly and (b))] the sectional views of the conventional dynamic pressure bearing.
[Drawing 2] It is the sectional view of the motor concerning the gestalt of the 1st operation of this invention.
[Drawing 3] It is drawing showing the flow like the erector of a motor.
[Drawing 4] (a) is [the sectional view of a motor fixed assembly and (c of the sectional view of a **** member and (b))] the sectional views of a motor rotation assembly.
[Drawing 5] It is the sectional view of dynamic pressure bearing.
[Drawing 6] It is the top view of a **** member.
[Drawing 7] (a) is the top view of other examples of a **** member, and (b) is the sectional view of other examples of a **** member.
[Drawing 8] (a) is the top view of the example of further others of a **** member, and (b) is the sectional view of the example of further others of a **** member.
[Drawing 9] It is the sectional view of bearing.
[Drawing 10] It is the sectional view of the motor concerning the gestalt of operation of the 2nd of this invention.
[Drawing 11] (a) is [the sectional view of a motor fixed assembly and (c of the sectional view of a motor rotation assembly and (b))] the sectional views of a **** member.
[Drawing 12] It is the sectional view of bearing.
[Drawing 13] It is the top view of a **** member.
[Drawing 14] It is the sectional view of bearing.
[Drawing 15] It is the sectional view of the motor concerning the gestalt of operation of the 3rd of this invention.
[Drawing 16] For (a), the sectional view of a rotor hub and (b) are [the side elevation of a shaft and (d of the sectional view of a **** member and (c))] the sectional views of a motor fixed assembly.
[Drawing 17] It is the sectional view of bearing and a stator.
[Drawing 18] It is the top view of a **** member.
[Drawing 19] It is the mimetic diagram showing the internal configuration of a disk driving gear.
[Description of Notations]
1 Motor
4 Shaft
4d Cone section
8 Sleeve
14 Stator
16 Rota Magnet
20 **** Member
20a Stop section
50 Disk Driving Gear
51 Housing
52 Motor for Disk Drive
53 Record Medium
60 Rota
C1, C3-C7 Crevice
C2 Opening
F Oil
MC Interface
MR1 and MR2 Motor rotation assembly
MS1, MS2, and MS3 Motor fixed assembly
S11-S17 Step

[Translation done.]

* NOTICES *

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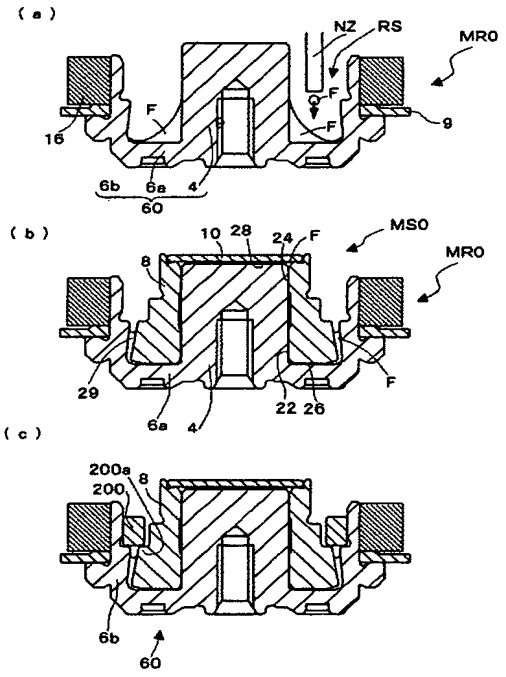
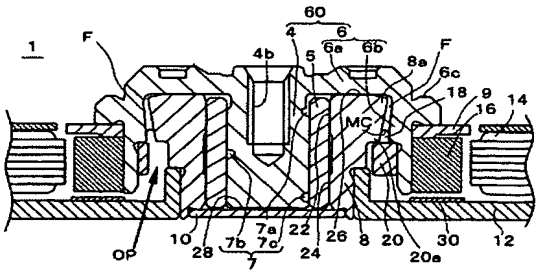
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

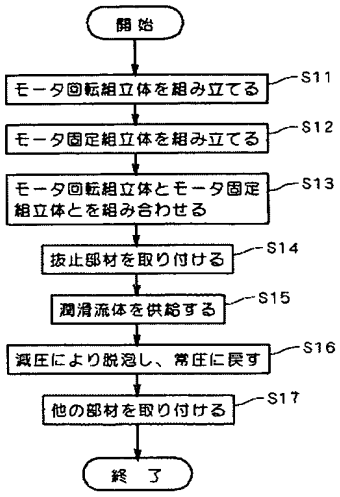
[Drawing 1]



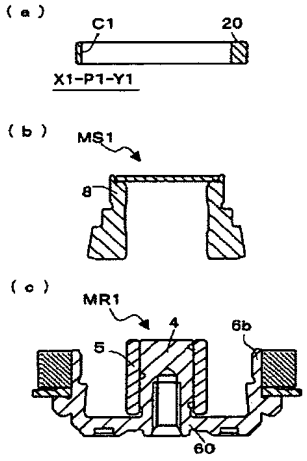
[Drawing 2]



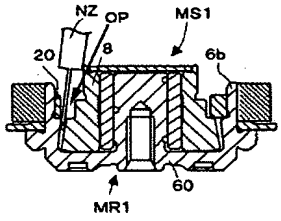
[Drawing 3]



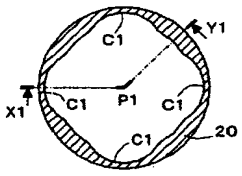
[Drawing 4]



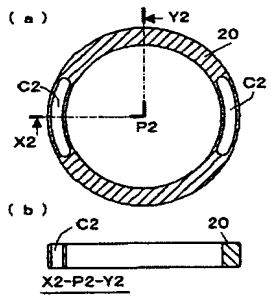
[Drawing 5]



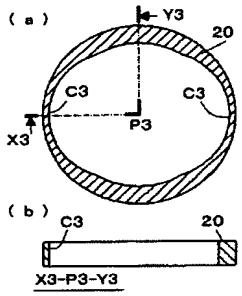
[Drawing 6]



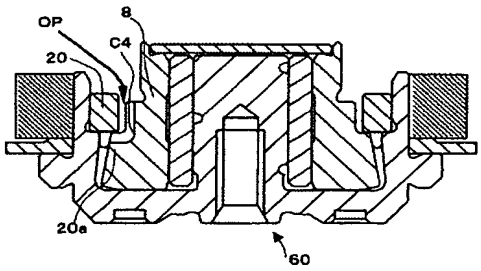
[Drawing 7]



[Drawing 8]



[Drawing 9]



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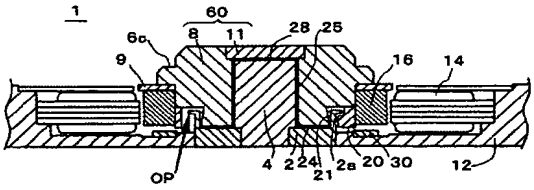
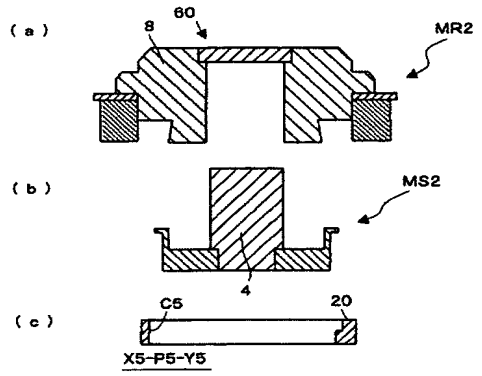
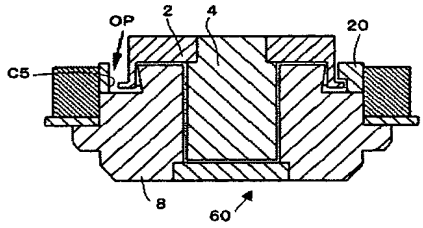


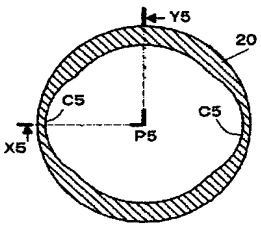
[Drawing 11]



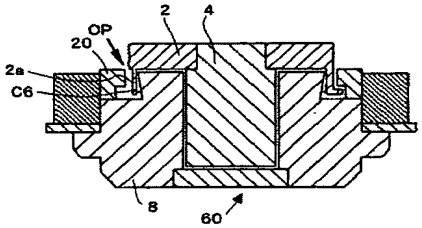
[Drawing 12]



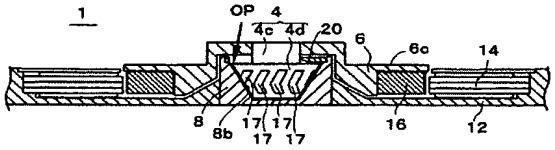
[Drawing 13]



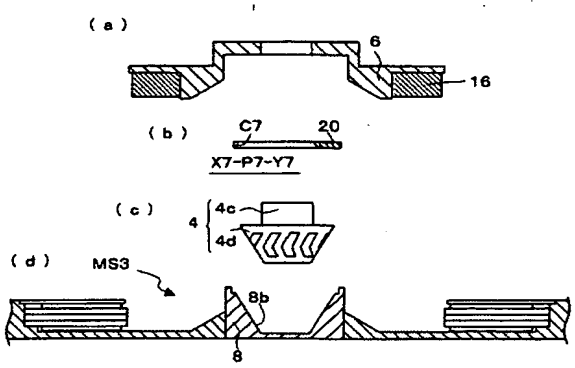
[Drawing 14]



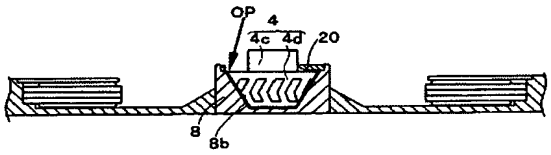
[Drawing 15]



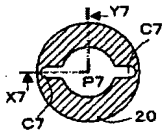
[Drawing 16]



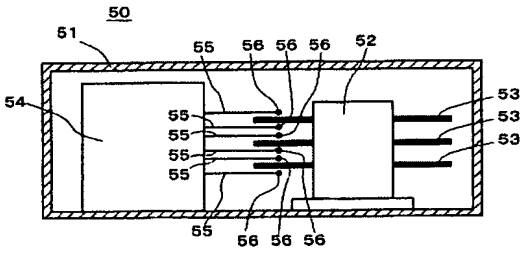
[Drawing 17]



[Drawing 18]



[Drawing 19]



[Translation done.]